

## REMARKS

### STATUS OF CLAIMS AND SUPPORT FOR CLAIM CHANGES

1. (Pending) Support for the amendment to claim 1 can be found, for example, in column 12, lines 30-40, of the specification.
2. (Pending) Support for the amendment can be found in column 7, lines 1-3 and Figure 3.
3. (Pending) The amendment to claim 3 is editorial, e.g., by referring the “enzyme” as “prenyl diphosphate sunthase” to be consistent with claim 1 as supported by the patent claim 3.
4. (Pending) The amendment to claim 4 is editorial, e.g., by referring the “enzyme” as “prenyl diphosphate sunthase” to be consistent with claim 1 as supported by the patent claim 4.
5. (Canceled)
6. (Pending) The amendment to claim 6 is editorial by referring the “enzyme” as “prenyl diphosphate sunthase” to be consistent with claim 1 and supported by the specification at column 6, lines 22-34.
7. (Pending) The amendment is supported by Figure 2 and column 13, line 1.
- 8-10. (Canceled)
11. (Pending)
12. (Pending)
13. (Pending)
14. (Pending) Claim 14 is amended to be directed to an isolated host organism, the support for which can be found in column 7, lines 27-44, and column 8, lines 26-61, and Example 5.
15. (Pending) The amendment is editorial by referring the “enzyme” as “prenyl diphosphate sunthase” to be consistent with claim 1.
16. (Pending) The claim dependency is changed to remove dependency on the canceled claim 5.
- 17-48. (Canceled)

49. (Pending) Claim 49 is presented as new. Support may be found, for example, in column 6, lines 48-49.

50. (Pending) Claim 50 is new. Support may be found, for example, in the column 6, lines 50-51.

51. (Pending) Claim 51 is presented as new. Support may be found, for example, in column 6, lines 52-54.

52. (Pending) Claim 52 is presented as new. Support may be found, for example, in column 6, lines 55-58.

53. (Pending) Claim 53 is presented as new. Support may be found, for example, in column 6, lines 59-63.

54-63. (Canceled)

Claims 1-4, 6, 7, 11-16 and 49-53 are pending. Claims 5, 8-10 and 17-48 are canceled. Claims 49-53 are new claims.

Claim 2 is amended to more specifically recite the synthesized prenyl diphosphate as farnesyl diphosphate.

The replacement of “enzyme” with “prenyl diphosphate synthase” in claims 3, 4, 6 and 15 is editorial and would not narrow the scope of the amended claim recitations.

New claims 49-53 are drawn to specific embodiments of the mutant enzyme.

### **Specification**

Applicants respectfully traverse the objection to the specification on the grounds that the amendments to the specification filed on March 18, 2005 allegedly introduced new matter, in particular, in column 4, lines 15-34 and column 5, line 66 to column 6, line 16. In order to advance prosecution, the amendments related to DDXX(XX)D have been removed as shown above. Withdrawal of the new matter objection is requested.

### **Claim Rejections - 35 USC § 112, Second Paragraph**

Applicants respectfully traverse the indefiniteness rejections of claims 3, 5, 6 and 16. The cancellation of claim 5 has rendered the rejection of claim 5 moot.

Claim 3 has been amended by replacing “the reaction product” with “a reaction product” so that it is clear that farnesyl diphosphate is not the only reaction product. Claim 6 has been amended by reciting that the mutant prenyl diphosphate synthase is a mutant enzyme of *Sulfolobus acidocaldarius* which is clear to one skilled in the art because the wild-type prenyl diphosphate of SEQ ID NO:1 is an enzyme of *Sulfolobus acidocaldarius*.

Withdrawal of the indefiniteness rejections of claims 3 and 6, as well as claim 16 dependent therefrom, is requested.

### **Claim Rejections - 35 USC § 112, First Paragraph**

#### **I. Written Description Rejections**

Applicants respectfully traverse the written description rejections of claims 2 and 16. Page 6, line 1, of the Office Action concludes that there is descriptive support for the mutant prenyl diphosphate synthase synthesizing a greater amount of farnesyl diphosphate than the wild-type enzyme as evidenced by Figure 3. Thus, the insertion of “synthesizes more farnesyl diphosphate than the amount of farnesyl diphosphate synthesized by the wild type prenyl diphosphate synthase under similar conditions” into claim 2 meets the written description requirement. Withdrawal of the written description rejections of claim 2, and claim 16 dependent therefrom, is requested.

Applicants respectfully traverse the written description rejections of claims 54-57 and 62-63. However, to advance prosecution, claims 54-57, 62 and 63 have been cancelled, rendering the rejections moot.

Applicants respectfully traverse the new matter rejections of claims 7 and 16. Claim 7 has been amended to be directed to a mutant prenyl diphosphate synthase according to claim 1 having a higher enzymatic activity, using isopentenyl diphosphate as a substrate at a temperature of 80 °C, than that of the wild-type prenyl diphosphate synthase. Figure 2 shows that the enzyme activities of mutant enzymes 1-5 were higher than that of the wild type SacGGPS at 80 °C when isopentenyl diphosphate was used as the substrate (see column 13, lines 1-14). Thus, claim 7 as amended has descriptive support. Withdrawal of the written description rejections of claims 7 and 16 is requested.

Applicants respectfully traverse the written description rejections of claims 54-61 and 58-61, 62 and 63. In order to advance prosecution, claims 54-63 have been cancelled.

Applicants respectfully traverse the written description rejections of claim 2 for being directed to a mutant prenyl diphosphate synthase that has the activity of synthesizing more of **any** prenyl diphosphate as compared to that of the wild type. Page 14, lines 5-7, of the Office Action concludes that one of skill in the art would recognize that applicants were in possession of a mutant prenyl diphosphate synthase that synthesizes more farnesyl diphosphate as compared to that of the wild type prenyl diphosphate synthase having an amino acid sequence of SEQ ID NO:1. Claim 2 has been amended to recite that the mutant prenyl diphosphate synthase synthesizes more farnesyl diphosphate than the wild type as supported by Figure 3. The written description rejection of claim 2 should be withdrawn.

Applicants respectfully traverse the written description rejections of claims 5 and 6 on the ground that the mutant prenyl diphosphate synthase of claim 1 is not a prenyl diphosphate synthase of an archaea or *Sulfolobus acidocaldarius*. Claim 5 has been cancelled. Claim 6 has been amended to recite that the mutant prenyl diphosphate synthase of claim 1 is a mutant enzyme of *Sulfolobus acidocaldarius*. Withdrawal of the written description rejections of claims 5 and 6 is requested.

Applicants respectfully traverse the written description rejection of claim 7. The Examiner took a position that the applicants were not in possession of the mutant prenyl diphosphate synthase having an unlimited increase in thermostability. Claim 7 has been amended to recite that the mutant prenyl diphosphate synthase has a higher enzymatic activity using isopentenyl diphosphate as a substrate than that of the wild type at 80 °C as supported by Figure 2 and column 13, line 1. Withdrawal of the written description rejection of claim 7 is requested.

Applicants respectfully traverse the written description rejections of claims 54-63. With the cancellation of claims 54-63, withdrawal of the written description rejections is requested.

## II. Non-Enablement Rejections

Applicants respectfully traverse the nonenablement rejections of claims 2, 5-7, 14 and 54-63.

Claim 2 was rejected as not enabling the mutant prenyl diphosphate synthase having the activity of making more of **any** prenyl diphosphate as compared to that of the wild type. Page 17, lines 9-11, of the Office Action concludes that the mutant prenyl diphosphate synthase synthesizes more farnesyl diphosphate as compared to that of the wild type. Claim 2 has been amended to recite that the mutant prenyl diphosphate synthase has the activity of making more farnesyl diphosphate as compared to that of the wild type as shown in Figure 3. Withdrawal of the non-enablement rejection of claim 2 is requested.

Applicants respectfully traverse the non-enablement rejections of claims 5 and 6 on the ground that the mutant prenyl diphosphate synthase of claim 1 is not a prenyl diphosphate synthase of an archaea or *Sulfolobus acidocaldarius*. Claim 5 has been cancelled. Claim 6 has been amended to recite that the mutant prenyl diphosphate synthase of claim 1 is a mutant enzyme of *Sulfolobus acidocaldarius*. Withdrawal of the non-enablement rejections of claims 5 and 6 is requested.

Claim 7 was rejected as not enabling the mutant prenyl diphosphate synthase having an unlimited thermostability as compared to that of the wild type. Claim 7 has been amended to recite that the mutant prenyl diphosphate synthase has a higher enzymatic activity using isopentenyl diphosphate as a substrate than that of the wild type at 80 °C as supported by Figure 2 and column 13, line 1. Withdrawal of the non-enablement rejection of claim 7 is requested.

Claim 14 was rejected as not enabled because the host organism encompasses a plant and that there is a high level of unpredictability in making a transgenic plant. Page 18, the last paragraph, of the Office Action acknowledges that the specification enables the production of an isolated host organism. Claim 14 has been amended to be drawn to an isolated host organism transformed with a recombinant vector of claim 13. Withdrawal of the non-enablement rejection of claim 14 is requested.

Claims 54-63 were rejected as non-enabled. Without acquiescence with the rejections, claims 54-63 have been cancelled to advance prosecution. The non-enablement rejections of claims 54-63 have been rendered moot.

### **Double Patenting Rejections**

Applicants would like to thank the Examiner for withdrawing the obviousness-type double patenting rejections of claims 1-6 and 8-10 over claims 1 and 4 of U.S. Patent No. 5,807,725, and the obviousness-type double patenting rejections of claims 11 and 13-15 over claims 1-4 of U.S. Patent No. 5,882,909.

Applicants contend that claims 1-4, 6 and 8-10 would not have been obvious over claims 1 and 4 of U.S. Patent No. 5,807,725 because the mutant geranylgeranyl diphosphate synthase according to claims 1 and 4 of U.S. Patent No. 5,807,725 have different mutations than the mutant prenyl diphosphate synthase of the instant claims 1-4, 6 and 8-10. There would have been no suggestion or motivation of modifying the mutations in the mutant geranylgeranyl diphosphate synthase according to claims 1 and 4 of U.S. Patent No. 5,807,725 to arrive at the mutant prenyl diphosphate synthase of the instant claims 1-4, 6 and 8-10.

Applicants also contend that claims 11 and 13-15 would not have been obvious over claims 1-4 of U.S. Patent No. 5,882,909 because the genes encoding the mutant geranylgeranyl diphosphate synthase according to claims 1-4 of U.S. Patent No. 5,882,909 encode for different amino acid sequences than the mutant prenyl diphosphate synthase encoded by the DNA of the instant claim 11, the DNA in the recombinant vector of the instant claim 13 and the DNA in the recombinant vector used in the process of the instant claim 15. There would have been no suggestion or motivation of modifying the mutations in the genes for the mutant geranylgeranyl diphosphate synthase according to claims 1-4 of U.S. Patent No. 5,882,909 to arrive at the DNA of the instant claim 11, the DNA in the recombinant vector of the instant claim 13 and the DNA in the recombinant vector used in the process of the instant claim 15. Similarly, there would have been no suggestion or motivation to modify the genes according to claims 1-4 of U.S. Patent No. 5,882,909 to arrive at the isolated host organism transformed with the recombinant vector of the instant claim 13 to render claim 14 obvious.

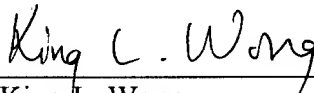
Page 20 of the Office Action asserts that claims 1-7 implicitly require the mutant prenyl diphosphate synthase to synthesize prenyl diphosphate shorter than the prenyl diphosphate synthesized by the wild type enzyme. Applicants respectfully disagree. Claims 1-4, 6 and 7 is silent, explicitly or implicitly, on any requirement of the mutant prenyl diphosphate synthase synthesizing prenyl diphosphate shorter than the prenyl diphosphate synthesized by the wild type enzyme.

**CONCLUSION**

The application is believed to be in a condition for allowance. The Examiner is invited to contact the undersigned to discuss any issues related to this application. The Office is authorized to charge any fees, including the extension fee, or credit any overpayment regarding this application to Kenyon & Kenyon LLP Deposit Account No. 11-0600.

Respectfully submitted,

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